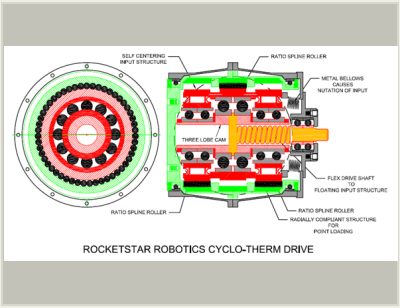
Small Business Innovation Research/Small Business Tech Transfer

Extreme Environment Hybrid Gearbox Technology, Phase II

Completed Technology Project (2012 - 2015)

Project Introduction

Nearly all mechanism applications require some form of gearbox. Wet lubricated gearbox technologies are limited to the relatively narrow temperature ranges of their lubricants. Dry lubricated gearboxes have proven to be problematic with poor life and reliability characteristics. Testing has shown that dry lubricated rolling elements can be made to work reliably provided they are operated at conservative contact stresses, however when dry film lubrications are tested under the sliding conditions in conventional transmissions they are no longer reliable. During the Phase I SBIR Rocketstar Robotics developed the preliminary design of a transmission that consists of all rolling elements and has eliminated all of the sliding elements that exist in conventional gearing. The transmission operates at contact stress values that are conservative and within the envelope proven through previous testing to provide reliable performance in rolling elements. The resulting transmission can be provided in a range of sizes and offers considerable torque capability within a reasonable envelope while operating within conservative rolling contact stress regimes at operating temperatures from near absolute zero to over 500C. The development and test of a successful prototype could revolutionize the torque transmission industry and open the door to mechanisms operations over a much broader temperature range than is now possible. Rocketstar Robotics proposes that the design be carried through the detailed design phase which includes detailed analysis models and that multiple prototypes be built of two different size transmissions. The units would then be tested for performance and life over the extremes of temperature from near cryogenic to 500C operation. Rocketstar will build 3 small 100 in-lb units and 3 large 400 in-lb units for testing along with spare splines to allow development testing with multiple DFL types. One of each unit will be delivered to NASA.



Extreme Environment Hybrid Gearbox Technology

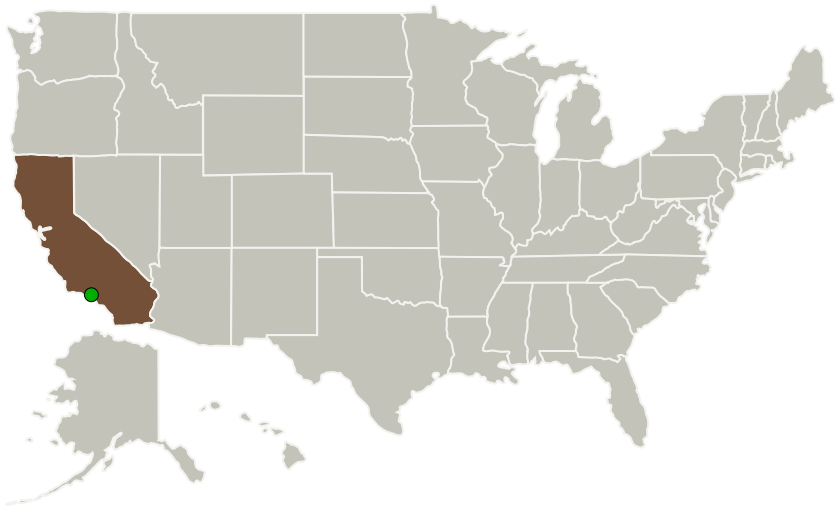
Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

Extreme Environment Hybrid Gearbox Technology, Phase II

Completed Technology Project (2012 - 2015)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
NEA Electronics, Inc.	Lead Organization	Industry	Moorpark, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

September 2012: Project Start

January 2015: Closed out

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

NEA Electronics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

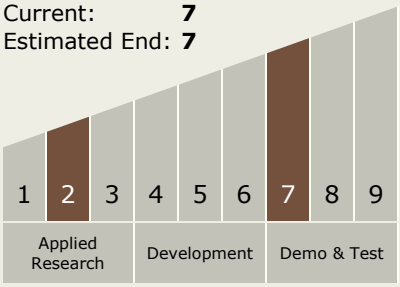
Carlos Torrez

Principal Investigator:

Douglas Peteresak

Technology Maturity (TRL)

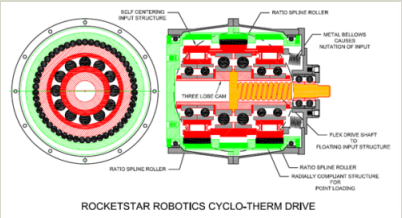
Start: **2**
Current: **7**
Estimated End: **7**



Extreme Environment Hybrid Gearbox Technology, Phase II

Completed Technology Project (2012 - 2015)

Images



Project Image
Extreme Environment Hybrid Gearbox Technology
(https://techport.nasa.gov/image/131686)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.4 Reliability, Life Assessment, and Health Monitoring

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System